H-Line

POWER SUPPLIES UNLIMITED

NJE CORPORATION KENILWORTH, NEW JERSEY

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INSTRUCTION MANUAL

H-LINE
MODEL_____

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SECTION I

SPECIFICATIONS AND DESCRIPTION

1-1 GENERAL. NJE High Voltage H* Line power supplies are grouped into four standard categories as follows:

a) H Line: Standard High Voltage Power Supplies with DC output only

b) HL Line: same as above but with ferro-resonant line regulators which provide ±1% output regulation, at constant load for ±10% changes in line voltage.

c) HA Line: same as H Line supplies but with addition of AC output

d) HAL Line: combination of (b) and (c) above.

1-2 PHYSICAL CONFIGURATION. All NJE H Line supplies fall into one of the following classifications:

a) "A" style: Air insulated unit in which the High Voltage section is built onto the same frame on which the Control Panel is mounted. These units all contain Selenium rectifiers.

b) "B" style: Air insulated units in which the High Voltage section and the Control Panel are on separate panels which are mounted in a single cabinet. These units all contain vacuum-tube rectifiers.

c) "C" style: (units): Oil insulated units in which the Control Panel is contained in one cabinet and the High Voltage section is in a separate oil-insulated tank with suitable interconnection cables provided. These units are rated 50KV and higher. Rectifiers are Selenium type.

HA Line models are similar to corresponding H Line models, except for additional AC output. HL and HAL Line models may have either line regulators contained within the Control Panel cabinet or in some cases a separate cabinet, with interconnection cables provided. For specific over-all dimensions, see Table I and Table II.

1-3 SPECIFICATIONS

Input: 115VRMS ± 10% 60 CPS, single-phase.

Output: Continuously variable by front panel control. See Table I and Table II for specific rating

* HO, HOL, HOA, and HOAL units are oil-insulated.

TABLE I

Model	Style	Output KV	Output MA	Line Current Amps.	Ripple RMS %	Internal Resistance
H-2.5-50	A	2.5	50	2.5A	2.0	12.5K
H-2.5-100	A	2.5	100	5.0A	3.5	6.25K
H-5-.5	A	5	5	0.5A	1.0	250K
H-5-25	A	5	25	2.5A	3.5	50K
H-5-50	A	5	50	5A	3.5	25K
H-5-100	A	5	100	10A	2	12.5K
H-5-200	B	5	200	15A	3.5	6.25K
H-10-5	A	10	5	10A	1.0	500K
H-10-25	A	10	25	5A	3.5	100K
H-10-50	A	10	50	10A	1.0	50K
H-10-100	B	10	100	15A	2.0	25K
H-15-10	A	15	10	3A	3.5	375K
H-15-20	A	15	20	6A	2.0	188K
H-20-5	A	20	5	2A	2.0	1 Meg
H-20-10	A	20	10	4A	3.5	500K
H-20-20	B	20	20	8A	2.0	250K
H-20-50	B	20	50	15A	3.5	100K
H-30-5	A	30	5	3A	2.0	1.5 Meg
H-30-10	A	30	10	6A	1.0	750K
H-30-35	B	30	35	15A	2.0	200K
HO-50-5	C	50	5	5A	2.0	2.5Meg
HO-50-10	C	50	10	10A	3.5	1.25Meg
HO-50-15	C	50	15	15A	3.5	1Meg
HO-60-10	C	60	10	10A	3.5	1.5Meg
HO-120-5	C	120	5	10A	2.0	6Meg
HO-150-5	C	150	5	15A	2.0	7.5Meg
HO-200-5	C	200	5	15A	3.5	10Meg

TABLE II

Model	Style	Control Cabinet Dimensions H	W	D	Tank Dimensions H	W	D	Shipping Weight
H-2 5-50	A	14"	21-3/4"	18"				150 lb.
H-2 5-100	A	14"	21-3/4"	18"				150 lb
H-5-. 5	A	14"	21-3/4"	18"				150 lb.
H-5-25	A	14"	21-3/4"	18"				150 lb
H-5-50	A	14"	21-3/4"	18"				150 lb.
H-5-100	A	14"	21-3/4"	18"				150 lb.
H-5-200	B	28"	21-3/4"	18"				250 lb.
H-10-5	A	14"	21-3/4"	18"				150 lb.
H-10-25	A	14"	21-3/4"	18"				150 lb.
H-10-50	A	14"	21-3/4"	18"				150 lb
H-10-100	B	28"	21-3/4"	18"				250 lb.
H-15-10	A	14"	21-3/4"	18"				150 lb.
H-15-20	A	14"	21-3/4"	18"				150 lb.
H-20-5	A	14"	21-3/4"	18"				150 lb.
H-20-10	A	14"	21-3/4"	18"				150 lb.
H-20-20	B	28"	21-3/4"	18"				250 lb.
H-20-50	B	28"	21-3/4"	18"				250 lb.
H-30-5	A	14"	21-3/4"	18"				150 lb
H-30-10	A	14"	21-3/4"	18"				150 lb.
H-30-35	B	28"	21-3/4"	18"				250 lb.
HO-50-5	C	14"	21-3/4"	18"	34"	22"	19"	600 lb.
HO-50-10	C	14"	21-3/4"	18"	34"	22"	19"	600 lb.
HO-50-15	C	14"	21-3/4"	18"	34"	22"	19"	600 lb.
HO-60-10	C	14"	21-3/4"	18"	34"	22"	19"	600 lb.
HO-120-5	C	14"	21-3/4"	18"	34"	22"	19"	600 lb.
HO-150-5	C	14"	21-3/4"	18"	38"	22"	22"	600 lb.
HO-200-5	C	14"	21-3/4"	18"	39"	36"	36"	700 lb.

Polarity: Either positive or negative with respect to ground.

Line Regulation: HL and HAL models only, ± 1% at constant load for ± 10% line variation

Load Regulation: 15-25%

Termination: A barrier type terminal strip, in the control section provides terminals for input, external interlock and line regulator connection. A High Voltage output cable is provided on all units. On "C" style tank units only, interconnection cable is provided.

Protection: External interlock provision, zero-start interlock, safety interlock overvoltage trip from 30 to 110% of maximum rating & overcurrent trip from 20 to 120% of maximum rating, automatic gravity fail-safe output grounding, and dead-front control elements are provided to make unit safe for operating personnel.

Meters: Three range output kilovoltmeter and milliammeter are both 3-1/2" rectangular 2% accuracy meter

Mounting: "A" and "B" styles are two-tone grey finish. "C" style has two-tone grey control section and dark grey High Voltage tank. Cabinets are in contrasting dark grey hammertone finish.

PANEL ELEMENT:

AC "ON-OFF" circuit breaker
AC line fuse in extraction post
AC "ON" pilot lamp
"INTERLOCK OPEN" lamp
"OFF-RESET" push button
OVERVOLTAGE trip lamp
OVERCURRENT trip lamp
SET TO ZERO lamp
HIGH VOLTAGE START push button
HIGH VOLTAGE ON button
OUTPUT VOLTAGE CONTROL KNOB
CONTROL fuse in extractor post
OVERCURRENT TRIP ADJUST knob
OVERVOLTAGE TRIP ADJUST knob
KILOVOLTMETER range switch
MILLIAMMETER range switch
OUTPUT VOLTMETER
OUTPUT MILLIAMMETER

ENVIRONMENTAL CONDITIONS:

These power supplies will operate to 35° C with humidity up to 50% and at altitude up to 5000 ft. For operation outside the above conditions consult the NJE Sales Department.

1.4 Optional Features: The following options are available on all standard catalog models and are indicated by a suffix letter added to the basic model number.

1.4.1 Suffix (F): FINE CONTROL. Output voltage control resolution increased to 0.03% of maximum rated voltage.

1.4.2 Suffix (R): RIPPLE REDUCTION. 5:1 ratio ripple reduction provided.

1.4.3 Suffix (V): WIDE RANGE OVERVOLTAGE TRIP. The overvoltage temperature range is extended to cover from 40% to 110% of nominal output voltage.

SECTION II

INSTALLATION AND OPERATING

2-1. INSTALLATION All H Line units are shipped with jumpers across meter terminals. These must be removed prior to using. "B" style units have their rectifier tubes packed in separate cartons/ These must be unpacked and properly installed in their sockets.

2-2 "C" style units after uncrating, must have the tank filled with 25KV test transformer oil to within 3/4" of the top of the tank ll Units are not shipped with oil.*

2-3 After unpacking and performing necessary operations as outlined in 2-1 and 2-2 above unit should be connected as follows:
ITEMS:

1 AC input using #14 AWG wire should be connected to input terminal board (TB1 or TB201). Care should be taken that the "HIGH" side of the line is connected to terminal #1, the neutral side to terminal #3 and the building or system ground to terminal #2.

2 If an external interlock is desired it may be connected to terminals #4 and #5 of the input terminal board. The jumper bar which is provided to short out these terminals must be romoved. The jumper bar may be left in place if no external interlock is required.

3 Connect the interconnection cable to the tank ("C" style unit only).

4 "A" and "B" style units are shipped with the High Voltage output cable permanently connected. For "C" style units the cable is shipped separately and must be inserted in its connector on the tank.

5 Run a #12 AWG ground wire from the DC ground wing nut (located on the rear of the cabinet or "A" and "B" style units and on tank cover "C" style units) to the external load.

6 Connect the load side of the output cable to the load.

7 The supply is now ready for operation.

2-4. Prelimary Setup- After unit has been unpacked and installed (see Sections 2-1 and 2-2 above) the supply is now ready for operation. Prior to turning the unit on, the following condition: hould apply:

ITEMS:

1 Set OUTPUT VOLTAGE CONTROL (T101) knob to extreme counterclockwide position.

*One 55 gal drum required for all C style units except HO-150-5 & HO-200-5 which require 255 gal drums.

2 Set OVERVOLTAGE TRIP CONTROL (R103A) knob and OVERCURRENT TRIP CONTROL (R103B) knob to extreme clockwise position.

3 Set AC Breaker (CB101) to the "ON" position.

4 Set KILOVOLT range switch (S104) and MILLIAMMETER range switch (S105) to the range required for the output expected.

5 If external interlock is used, make sure it is closed; if not, jumper terminals #4 and #5 of input terminal board (TB201 on "A" and "B" style units or TB1 on "C" style units).

6 The supply is now ready to be turned on.

2-5 OPERATION

ITEMS:

1 Momentarily depress the HIGH VOLTAGE ON button. The HIGH VOLTAGE ON lamp should light

2 Slowly rotate the OUTPUT VOLTAGE control knob clockwise, observing the output meters until the desired voltage and current levels are reached.

3 Slowly rotate the OVERVOLTAGE TRIP CONTROL until the supply turns off. The HIGH VOLTAGE ON lamp should go out and the OVERVOLTAGE lamp should light, provided output is from 80 to 110% of supply rating.

4 Rotate the OVERVOLTAGE TRIP CONTROL slightly clockwise. The OVERVOLTAGE TRIP CONTROL is now set.

5 Momentarily depress the OFF-RESET button. The OVERVOLTAGE lamp should go out and the SET TO ZERO lamp should light

6 Rotate the OUTPUT VOLTAGE control knob to the extreme counterclockwise position. The SET TO ZERO lamp should now go out.

7 Repeat steps (1) and (2).

8 Slowly rotate the OVERCURRENT TRIP CONTROL knob until the supply goes off The HIGH VOLTAGE ON lamp should go out and the OVERCURRENT lamp should light provided load current is from 20 to 120% of supply rating.

9 Rotate the OVERCURRENT TRIP CONTROL slightly clockwise. The OVERCURRENT TRIP CONTROL is now set

10 Momentarily depress the OFF-RESET button. The OVERCURRENT lamp should go out and the SET TO ZERO lamp should light.

11 Repeat step (6)

12 Repeat steps (1) and (2)

13 The supply is now ready for use.

2-6.1 POLARITY REVERSAL

"A" style: Polarity reversal may be accomplished as follows:

ITEMS:

1 Remove the unit from the cabinet.

2 Looking at the rear of the unit, note that the Selenium rectifiers are coded with red dots at one end of each rectifier cartridge.

3 Remove all the rectifiers and replace them in their clamps with the red dots in the position indicated on the schematic diagram for the polarity desired.

4 Set POLARITY switch (S106) to the desired position. This switch selects the proper polarity for the meter circuit only. See Control Circuit Parts Placement drawing at the rear of the manual for location of(S106).

5 Re-install unit in cabinet.

2-6.2 "B" style: Polarity reversal may be accomplished as follows:

1 Remove front panel mounting screws for control panel and slide control section out about three inches (3").

2 Set POLARITY switch to the desired position.

3 Slide control panel back in place and replace mounting screws.

4 Open rear door of cabinet and locate polarity reversing bars P201-P202, and P203-P204.

5 Remove the two reversing bars and re-insert them in the position for the polarity desired as indicated on the schematic diagram at the rear of the manual.

6 Close rear door

2-6. 3'C" style: Polarity reversal may be accomplished as follows.

1 Same as Par 2-6. 2 item 1

2 Same As Par 2-6. 2 item 2

3 Same As Par 2-6. 2 Item 3

4 Remove cover of tank

5 Lift out the rectifier assembly.

6 Re-insert the rectifier assembly with the red square in the proper direction for the polarity desired as indicated on the label on the cover of the tank.

7 Replace tank cover making sure all mounting hardware is replaced in its proper position.

2-7 For AC output, follow instruction on schematic diagram at the rear of the manual, for setting of reversing bars and/or rectifiers. POLARITY switch (S106) must be in AC position.

SECTION III

CIRCUIT DESCRIPTION AND THEORY OF OPERATION

3-1 GENERAL. All H, HC, HOL, HA, HAO, HAL, and HOAL units use the same basic full-wave, voltage doubler circuit. Output variation is accomplished by means of a variable autotransformer which varies the primary voltage to the high voltage transformer thus allowing adjustment from zero to rated output voltage.

3-2 The circuit description that follows is for the units which use Selenium rectifiers for (CR201 and CR202.) However the Vacuum Tube rectifier models function in identical manner with (V201 and V202) used in place of (CR201 and CR202) and with the filament transformer (T202) added to provide heater voltage for the Vacuum Tube rectifiers. For the purpose of the following discussion, the supply is assumed set for the positive DC output.

3-3 The schematic diagram located at the rear of the manual is diveded into two basic sections: the lower half comprises the High Voltage section while the upper half comprises the Control section. The Control section is identical schematically for all units. Component value changes for the control unit which change from unit to unit have their values unspecified on the Control section of the schematic. These values are noted in the notes on the High Voltage section of the drawing.

3-4 The "high" side of the input line is fed from terminal #1 of the input terminal board (TB1 or TB201) fed thru TB101-14 to the AC circuit breaker (CB101) and hence to (TB101-1.) A jumper connects TB101-1 to TB101-2 for units which are not provided with line regulators. (For line-regulated units, the line regulator is connected with its input connected to (TB101-1,) its output to (TB101-2) and its common to (TB101-3).

From TB101-2 the high of the line is fed to the input terminal (terminal #5) of the variable autotransformer (T101), thru the normally open contact K103B. Variable output is taken from terminal #3 of (T101) and fed thru the fuse (F102) (F102, F103 and Balancing Coil (L101) for units which, due to line current requirements, use two-ganged versions of (T101) thru (TB101-8) to terminal #3 of T201 (For line regulated models the connection is from (TB101-8 to TB201-2.)

3-5 The return for the input line is from (T201-1 thru TB101-6) back up to (T101-4 and TB101-16) and hence to input terminal board and hence to input terminal #3 (TB1 or TB2010)

3-6 Transformer (T201) steps up the input line voltage to a value sufficient to provide the DC output required.

3-7 The DC output is derived as follows: during one alternation of the voltage across the secondary of (T201,) terminal #4 is positive with respect to terminal #5. The current path is from terminal #4 of (TB201 thru CR201, thru C201A) (C201 in some models) and back to terminal #5 of (T201.)

During this interval C201A is charged to the peak voltage of the secondary of T201. On the succeeding alternation of line voltage, terminal # 5 of T201 is positive with respect to terminal #4. The path of current is from terminal #5 of T201 thru C201B (C202 in some models) to ground. From ground the path enters the ammeter circuit at TB101-13, goes thru the overcurrent trip circuit, the ammeter circuit and returns to T201-4 thru terminal TB101-10 and CR202. During this interval C201B is changed to the peak voltage of the secondary of T201 in such polarity that the voltages stored in C201A and C201B are additive. Load voltage is taken from the junction of CR201 and C201, passed thru limiting resistor R202, thru the load and returned thru ground terminal E201.

3-8. R201 is a limiting resistor for the output short circuit solenoid K101 thereby providing for safe discharge of the capacitors C201A and C201B (C201 and C202 in some models) when the High Voltage is turned off. R203 is a multiplier for the voltmeter circuit.

3-9 The control circuit performs the following functions:

a) Turn on, turn off and output voltage control.

b) Metering of output voltage and current

c) Safety protection circuitry.

3-10 After passing thru the AC circuit breaker (CB101) the line voltage is passed thru the AC fuse (F101) which protects the control circuitry. Presence of AC voltage into the supply when CB101 is in the ON position is indicated by AC pilot lamp DS101. Provided the external interlock is closed (or jumpered) and no overvoltage or overcurrent failure has locked up relay K101 or K102, line voltage is available at the COM point of S103. S103 is ganged to T101 in such a manner that when T101 is in the extreme counterclockwise position (Zero Output Voltage) the line voltage is available at S102 thru the COM an NO contacts of S103.

3-11 Momentary operation of HIGH VOLTAGE START button (S102) energizes K103 thereby completing the path to the input of T101, thru normally open contacts K103B, thus applying the line voltage (or some fraction of it depending on the setting of T101) to the primary of T201. When K103 is energized, HIGH VOLTAGE ON pilot lamp DS106 is lit, contacts K103A by pass (S102) thus locking up K103. Furthermore operation of HIGH VOLTAGE START button (S102) energizes K107, removing the output short on normally closed contacts K107A. K107 is locked up by the same contacts (K103A) which locks up K103.

3-12 The path of the voltmeter circuit is from the output point thru multiplier resistor R203 thru TB101-9, thru the OVERVOLTAGE TRIP circuit (see paragraph 3-14) thru the meter POLARITY switch (S106A), thru the voltmeter (M101) and its limiting resistor (R104) and back thru the meter POLARITY switch (S106B) thru TB101-10 to CR202. Thus the voltmeter is, for safety very close to ground potential. Diode CR101 is for surge protection of the voltmeter by passing the meter when its voltage exceeds 1 volt. KILOVOLTMETER switch (S104) selects LOW MEDIUM, and HIGH ranges for the output KILOVOLTMETER potentiometers R105 R106 and R107 are factory set to calibrate the meter in each of the three ranges.

3-13 The path of current thru the ammeter circuit is from E201 (ground) thru TB101-13, thru the OVERCURRENT TRIP circuit, thru S106D, thru the milliammeter (M102) and its limiting resistor CR108 thru R116 and R115 back thru S106C and TB101-10 to CR202. Resistor R114 serves as a shunt around the microammeter. Resistor R115 and R116 in conjunction with C101 serve as a filter as current flows thru the meter circuit only during the time CR202 conducts. CR102 protects the current meter in the same manner as CR101 protects the voltmeter. MILLIAMMETER switch (S105) selects LOW, MEDIUM, or HIGH milliampere range for M102. Potentiometer R114 R110 and R111, are factory set to calibrate the meter in each of its three ranges.

3-14 As indicated in paragraph 3-12, the current required to feed the voltmeter circuit passes thru the OVERVOLTAGE relay (K104), the OVERVOLTAGE TRIP CONTROL (R103A) and shunting resistor (R102) R103A may be set so that K104 will operate at any value of output voltage, from 80% to 110% of rated output. Operation of K104 even momentarily, will cause delay K101 to operate thru contacts K104A. Operation of K101 lights OVERVOLTAGE lamp DS103, locks K101 up on transfer contacts K101A and breaks the lockup pack of K103, thus turning the High Voltage off. The supply may be re-energized by rotating the OUTPUT VOLTAGE ADJUST knob to the extreme counterclockwise position. (thus closing the SET TO ZERO interlock S103) and momentarily operating the OFF-RESET button (S101), thereby resetting relay K101, and momentarily operating High Voltage Start button (S102).

3-15 In a manner similar to the OVERVOLTAGE TRIP circuit described above in paragraph 3-14 the current required for the milliammeter circuit passes thru the OVERCURRENT TRIP relay (K105) OVERCURRENT TRIP control (R103B), bypass resistor R113 and filter capacitor C102. The action is the same as for the OVERVOLTAGE circuit except that relay K105 when operated locks up relay K102 and lights OVERCURRENT lamp (DS104) The method of resetting is identical as for OVERVOLTAGE failure per paragraph 3-14. R103B may be set so that K105 will operate at any value of output current from 20% to 120% of rated current.

3-16 Additional Safety features are:

a) The INTERLOCK OPEN lamp which lights when either external or door interlocks are open and prevents the supply from being energized while this condition exists.

b) SET TO ZERO interlock, prevents the supply from being turned on unless the OUTPUT VOLTAGE control is set for zero output voltage

c) Output shorting relay K701, which shorts out the output whenever the supply is turned off thus preventing dangerous voltages from existing due to capacitor charge. This is a gravity-drop type relay so that failure of the relay itself will not prevent the output from being short circuited.

3-17 When the supply is designed for AC/DC output and the AC output is being used the output voltmeter reads approximately the peak value of the AC voltage and the ammeter circuit is shorted out. Both OVERVOLTAGE and OVERCURRENT TRIP circuits are still in operation.

SECTION IV

MAINTENANCE PROCEDURES

4.1 METERING CIRCUIT CALIBRATION:

In the event the panel meters or their associated circuitry require replacement, the following recalibration procedure may be necessary. CAUTION: EXTREME CARE MUST BE EXERCISED WHEN WORKING AROUND THE HIGH-VOLTAGE CIRCUITRY.

4.1.1 Overcurrent Adjust Circuit:

4.1.1.1 Locate the OVERCURRENT calibration resistor, R113 using the Part Placement Drawings and Schematic Diagram of Section V as reference.

4.1.1.2 Set R113 to minimum resistance.

4.1.1.3 Set the OVERCURRENT TRIP CONTROL (R103B) fully clockwise.

4.1.1.4 Short out the power supply output through a precision milliammeter (in the ground leg) having a full scale rating of approximately 125% of the maximum power supply rating.

4.1.1.5 Energize the power supply and very slowly increase the output voltage control until the external milliammeter reads 120% of maximum supply rating.

4.1.1.6 Increase the resistance of R113 until overcurrent trip circuit actuates as evidenced by the lighting of the OVERCURRENT light.

4.1.1.7 Fasten the slider of R113 and recheck to verify that overcurrent trip occurs at the 120% point. Trim the adjustment of R113 if necessary.

4.1.2 Milliammeter Circuit:

4.1.2.1 Loosen the screws that hold the Control Panel in place and slide the Control Panel out approximately 1-1/2 inches and clamp one of the lower runner angles to its support angle, using a "C" clamp.

4.1.2.2 Locate the milliammeter calibration resistors R110 and R111 and R114 on the Control Panel using the Part Placement Drawings and Schematic Diagram of Section V as reference.

4.1.2.3 Set the OVERCURRENT TRIP CONTROL (R103B) fully clockwise.

4.1.2.4 Set the MILLIAMMETER range switch (S105) to the low position.

4.1.2.5 Short out the output of the power supply through a precision milliammeter having a full scale rating slightly higher than the full scale rating of the front panel milliammeter in its LOW range.

4.1.2.6 Energize the power supply and slowly increase the output voltage control until the external milliammeter reads the same as the full scale rating of the milliammeter in the low range.

4.1.2.7 Adjust R114 until the front panel milliammeter reads exactly full scale.

4.1.2.8 Successively repeat the calibration procedure for the MEDIUM and HIGH ranges making sure that S105 is in the proper position, the external ammeter has the proper range and the current calibration resistors R110 and R111 are used for the respective ranges.

4.1.3 Kilovoltmeter Circuit:

4.1.3.1 Loosen the screws that hold the Control Panel in place and slide the Control Panel out approximately 1-1/2 inches and clamp one of the lower runner angles to its support angle, using a "C" clamp.

4.1.3.2 Locate the KILOVOLTMETER calibration resistors, R105, R106 and R107 on the Control Panel using the Part Placement Drawing and Schematic Diagram of Section V as reference.

4.1.3.3 Set the KILOVOLTMETER range switch (S104) to the LOW position and OVERVOLTAGE TRIP CONTROL (R103A) fully clockwise.

4.1.3.4 Connect an external precision Kilovoltmeter having full scale rating of approximately 120% of the low range full scale rating of the Front Panel Kilovoltmeter across the power supply output.

4.1.3.5 Energize the power supply and slowly increase the Output Voltage Control to maximum rated voltage of the supply. The external Kilovoltmeter and Front Panel Kilovoltmeter should read the same voltage.

4.1.3.6 Adjust the LOW range calibration resistor (R105) until the Front Panel Kilovoltmeter reads the same voltage as the external kilovoltmeter.

4.1.3.7 In like manner, recalibrate the MEDIUM and HIGH range using R106 and R107 respectively.

4.2 TANK OIL MAINTENANCE:

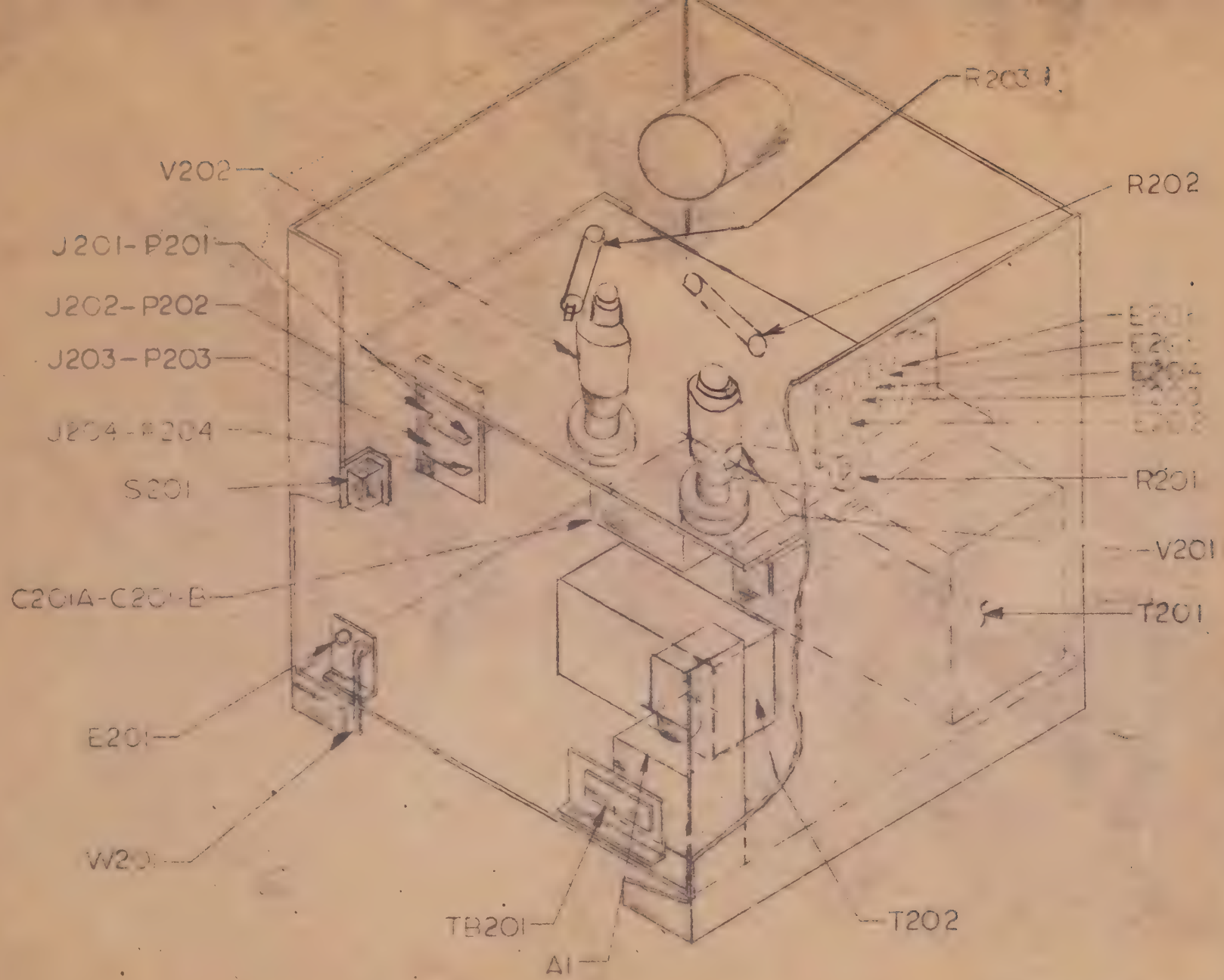
Transformer oil may in time accumulate moisture, sludge and dirt. Furthermore, carbon will tend to form on the spheres of the output grounding switch each time there is a flash-over between them when the switch is closed. Therefore, periodically, depending upon the atmospheric conditions in which the equipment is used and the frequency of start-up and shut down the oil must be either cleaned or replaced. This situation becomes obvious when "ticking" noises begin to be heard from inside the tank, indicating sparking between components.

It is usually cheaper to replace oil than to clean it. However, if very large volumes of oil are involved it may be economical to install a filtering system. Manufacturers of this equipment include:

1. Cunno Engineering Corporation
   Meriden, Cuno
2. Sharples Corporation
   Philadelphia, Pa.
3. Houdaille Hershey of Indiana, Inc.
   Lebanon, Indiana
4. Hilliard Corporation
   Elmira, New York

SUGGESTED OIL SOURCES

Manufacturer	Part No.
Gulf Oil Company	Paramount #33
Sun Oil Company	Sun #HT
Shell Oil Company	DIALAAX
Esso	UNIVOLT #35



HIGH VOLTAGE SECTION	NJE 100-54

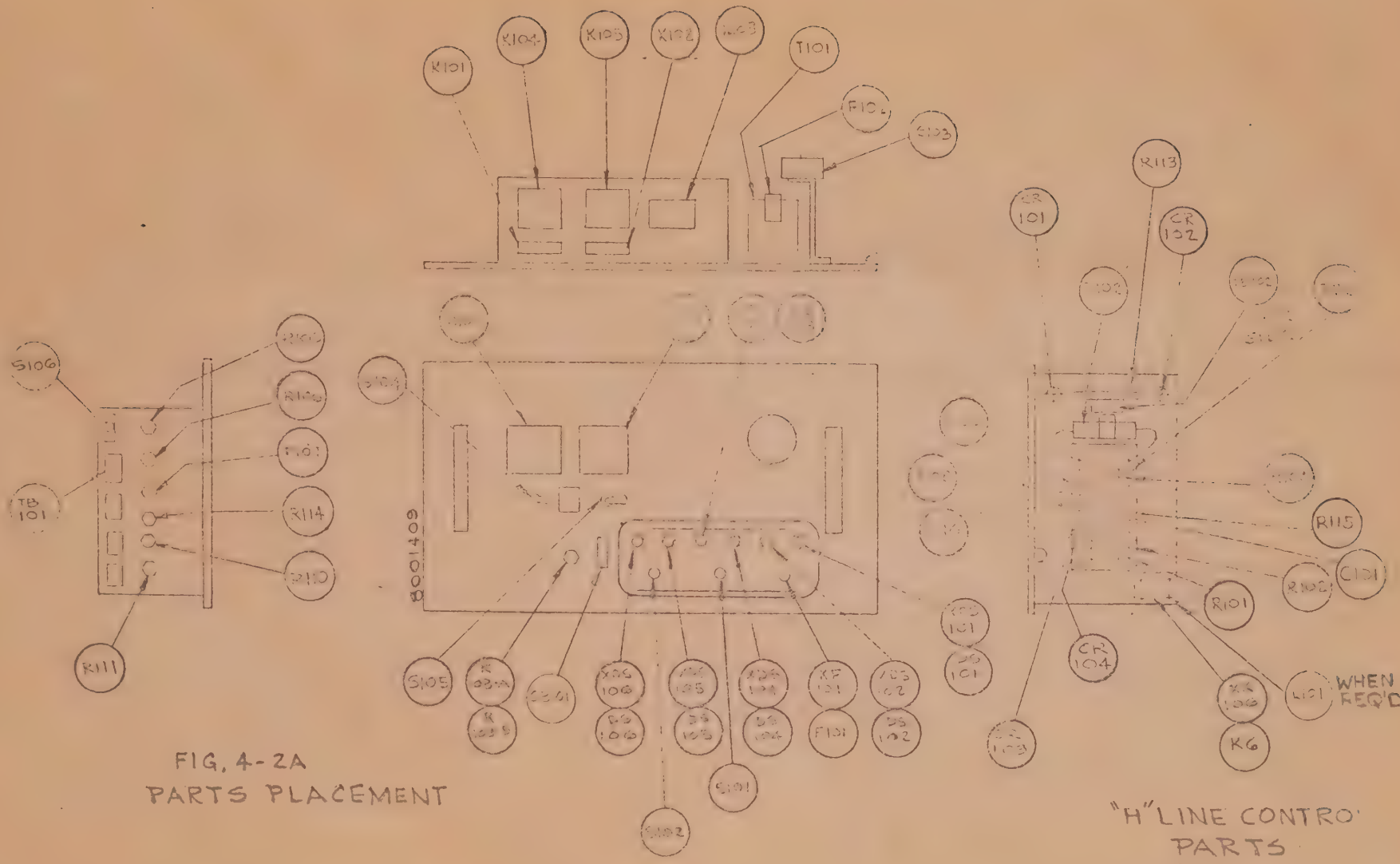


FIG. 4-2A
PARTS PLACEMENT

"H" LINE CONTRO
PARTS
PLACEMENT
NJE A100424

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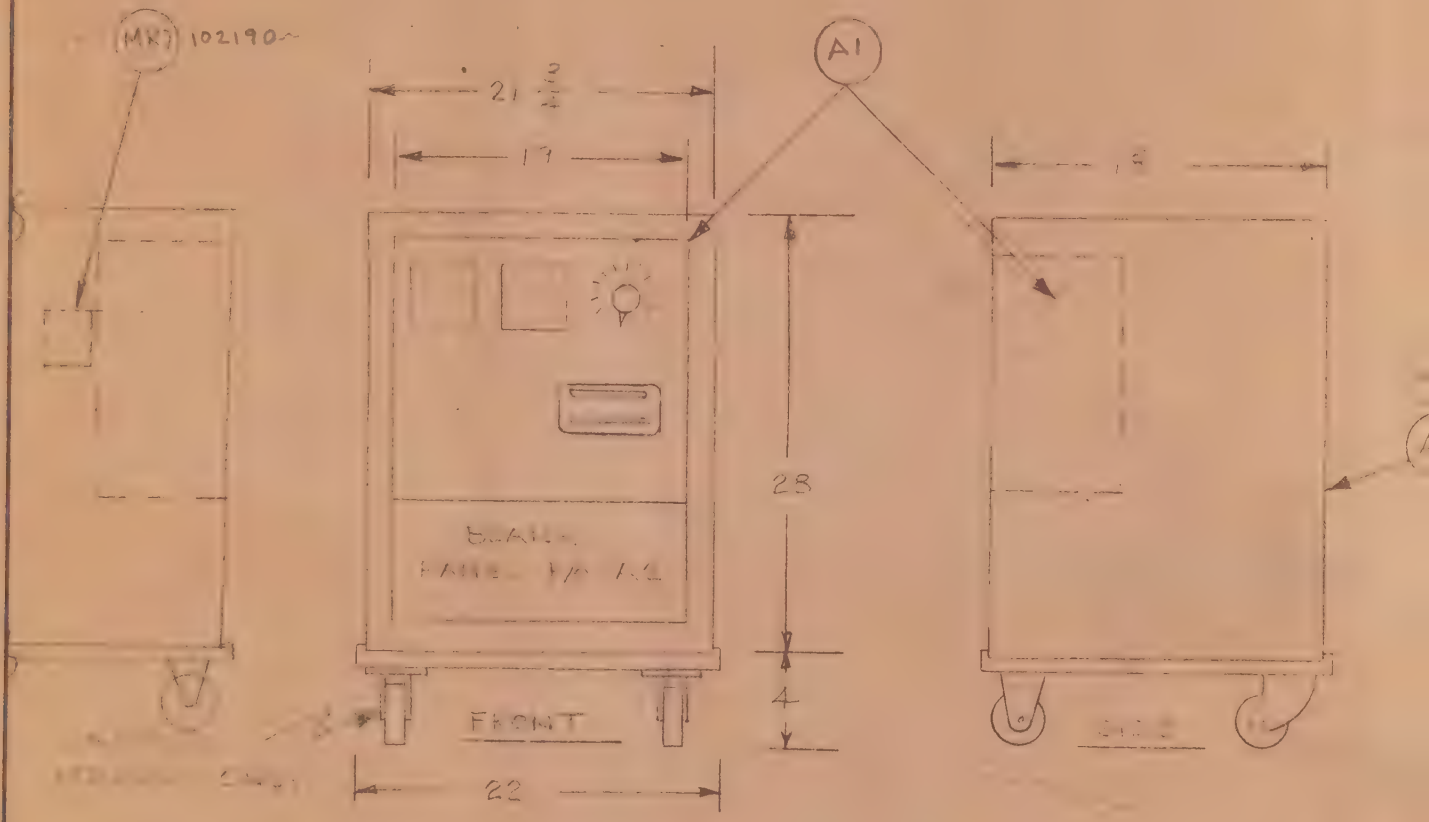


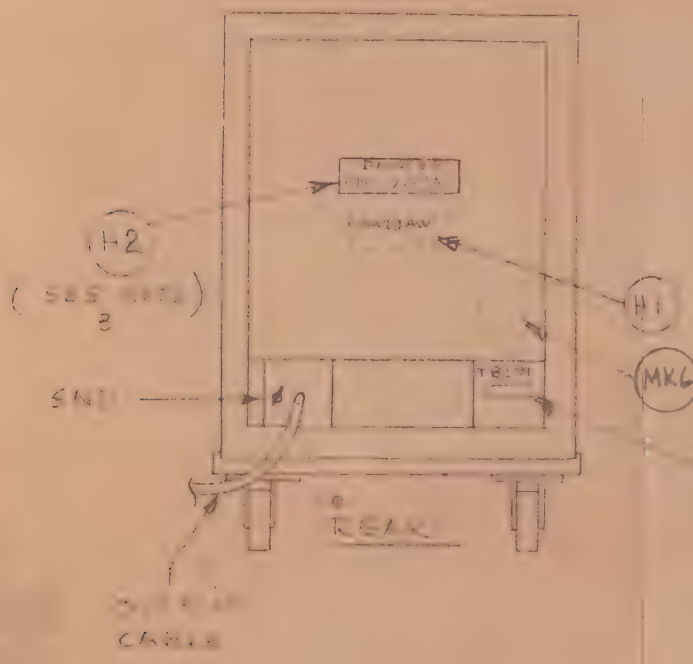
		UNLESS OTHERWISE SPECIFIED
		DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ± DECIMALS ± ANGLES ±
		MATERIAL
		PROTECTIVE FINISH
NEXT ASSY.	USED ON	
APPLICATION		

MICROFILM

OGILVIE PRESS, INC., BROOKLYN 17, N. Y. NJE FORM 108

REV SYM

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	H2 WAS H1	5/	
B	/	12/	
C	ADDED MK		
D	ADDED MK 7	3/2/66	



103972

NOTE
1. PRODUCTION TO FACTORY
TOP DOOR DOWN WITH SCREWS
2. ASSEMBLE TYPE 100 C
3. ADD DANGER HIGH VOLTAGE
TO TOP & REAR DOORS.

INSERT
TERM. BOARD

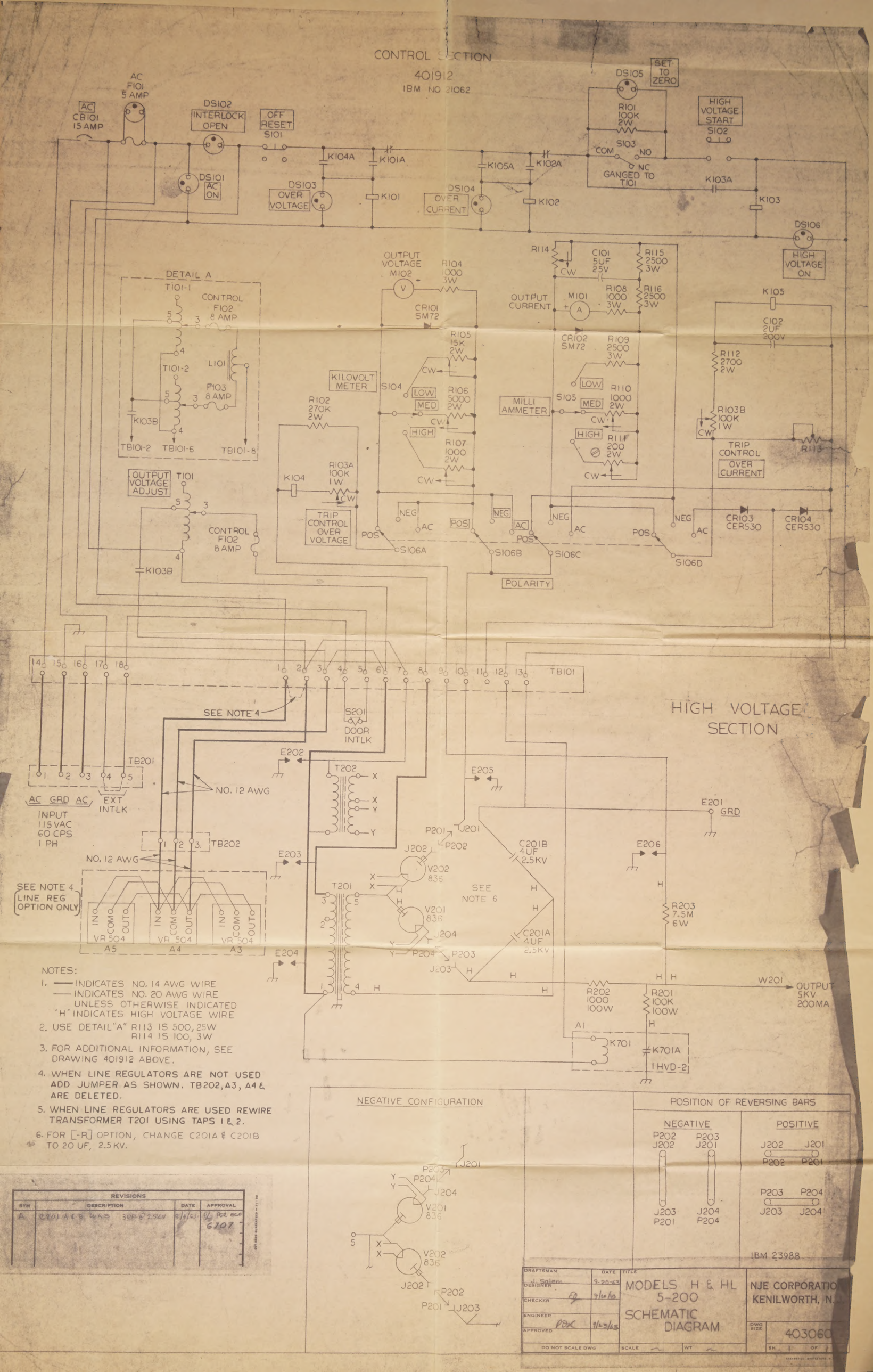
DRAFTSMAN	DATE	TITLE
E J	4/20/6	
DESIGNER		
CHECKER		
ENGINEER		
APPROVED		

DO NOT SCALE DWG | SCALE | WT

NJE CORPORATION
KENILWORTH, N. J.

DWG SIZE B

SH OF



NOTES:

1. —— INDICATES NO. 14 AWG WIRE
   —— INDICATES NO. 20 AWG WIRE UNLESS OTHERWISE INDICATED
   "H" INDICATES HIGH VOLTAGE WIRE
2. USE DETAIL "A" R113 IS 500, 25W
   R114 IS 100, 3W
3. FOR ADDITIONAL INFORMATION, SEE DRAWING 401912 ABOVE.
4. WHEN LINE REGULATORS ARE NOT USED ADD JUMPER AS SHOWN. TB202, A3, A4 & ARE DELETED.
5. WHEN LINE REGULATORS ARE USED REWIRE TRANSFORMER T201 USING TAPS 1 & 2.
6. FOR [-R] OPTION, CHANGE C201A & C201B TO 20 UF, 2.5 KV.

NEGATIVE CONFIGURATION

POSITION OF REVERSING BARS

NEGATIVE	POSITIVE
P202 J202 / J203 P201	J202 J201 / P202 P201
P203 J201 / J204 P204	P203 P204 / J203 J204

IBM 23988

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	C201 A & B WAS 30P-6 2.5KV	6/6/63	PER ECO 6707

DRAFTSMAN J. Salem	DATE 9-20-63	TITLE MODELS H & HL 5-200 SCHEMATIC DIAGRAM	NJE CORPORATION KENILWORTH, N.J.
DESIGNER			
CHECKER EJ	9/20/63		
ENGINEER			DWG SIZE 403060
APPROVED PBK	9/23/63		SH 1 OF 1
DO NOT SCALE DWG		SCALE	WT